SUMMARY

This is a thermally formed plastic glass-shaped container with a hermetic seal consisting of an aluminum sheet attached to its opening; to be used as a container for milk, jellies, juices, and other perishable products. It is characterized by having a bottom lid initially convex towards the outside, with a series of symmetrically designed folds distributed uniformly throughout the surface of this bottom lid.

MOVING-BOTTOM CONTAINER

SUMMARY OF THE INVENTION

This invention is related to containers that are particularly manufactured with thermally formed plastic materials, with a hermetic seal provided by an aluminum foil or sheet, to contain perishable products such as milk products, jellies, juices, and others, which require medium-length useful life in special storage conditions.

BACKGROUND OF THE INVENTION

Since the beginning of commerce, containers have been essential for transporting many types of products. Our ancestors contributed with glass bottles, clay amphoras, and leather bags. But it was not until the industrial revolution came that the need to create a great number of similar items was created for transport, thus turning the packaging industry economically important.

Virtually all the manufactured and processed goods require to be packaged at some stage in their production and distribution. Fresh foods require the protection and convenience that their packages provide. Special and artistic knowledge is required, as well as specific facilities and machinery, to create packages that meet one or more basic requirements such as environmental protection, manageable units, machine performance when filling, communications to identify contents and help in marketing, and easy disposal.

With the discovery of plastic materials and the current developments in technology, the use of packages fabricated with these materials has reached an enormous popularity due to their endurance, light weight, easy handling, being hermetic, and others. Due to these excellent features, there are today an infinity of packages in many shapes that fulfill the needs for storage, transport, and use of the packaged products.

Currently, thermally formed plastic containers, with a hermetic seal provided by an aluminum sheet or foil attached to the container's opening to allow closing, are being used. These containers are designed in the shape of a glass and are used to contain milk products, jellies, juices, etc., which vary between 50g and 1 kg. (see Figure 1). When packaging these foods, a free space 14 is allowed between the fill level 13 and the seal provided by the aluminum sheet 11.

In general, this container complies perfectly with the requirements mentioned above. However, the design of these containers such as the one in Fig. 1 presents us with some problems such as the following.

When this packaging is done in locations high above sea-level, such as Bogotá and Medellín, and the product is transported for its use in locations closer to sea-level, such as Barranquilla, Cali, Girardot, etc. a collapse of the side walls of the container becomes evident (see Fig. 2). They do not brake due to the container's strength, but the

appearance of the container deteriorates to the point of having an effect on the consumer's desire to purchase the product.

OBJECTIVE OF THE INVENTION

In agreement with the above mentioned consideration, it is evident that there is a need to have a container with the mentioned characteristics, known technically, in a way that it will not collapse by the effect of the changes in height relative to sea-level.

This invention has the objective of providing a container with the same general characteristics as the actual state of technology, but to which the structural shape and design of the bottom lid 15 (see Fig. 1) have been changed. This part of the container will have the task of compensating against changes of pressure, avoiding the collapse of the side walls, thus improving the quality of this type of container.

DESCRIPTION OF DRAWINGS

Figure 1 shows a view of a container built according to the previous technology.

Figure 2 shows a collapsed container built according to the previous technology.

Figure 3 shows a cutaway view of a container according to the invention.

Figure 4 shows a plant view taken from below the bottom lid of the container in Figure 3.

Figure 5 shows a cutaway view of a second variation of the style used in a container according to the invention.

Figure 6 shows a plant view taken from the bottom of the container of Figure 5.

Figure 7 shows a cutaway view of a third variation of the style used in a container according to the invention.

Figure 8 shows a plant view taken from the bottom of the container of Figure 7.

Figure 9 shows a cutaway view of a fourth variation of the style used in a container according to the invention.

Figure 10 shows a plant view taken from the bottom of the container of Figure 9.

Figure 11 shows a cutaway view of a fifth variation of the style used in a container according to the invention.

Figure 12 shows a plant view taken from the bottom of the container of Figure 11.

Figure 13 shows a cutaway view of a sixth variation of the style used in a container according to the invention.

Figure 14 shows a plant view taken from the bottom of the container of Figure 13.

Figure 15 shows a cutaway view of a seventh variation of the style used in a container according to the invention.

Figure 16 shows a plant view taken from the bottom of the container of Figure 15.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows filling container 10 up to level 13, allowing a free space or air chamber 14. When filling takes place, and the container is sealed with the aluminum foil 11, the air chamber 14 remains at the location's ambient pressure, where the filling operation takes place. The atmospheric pressure drops as you go higher above sea-level. Therefore, when such a filled and sealed container is moved to a location that is closer to sea-level than the location where it was filled, the higher pressure at the new location forces the air inside air chamber 14 to become smaller, thus generating a vacuum inside the container, causing the collapse of the container's side walls; which is an undesirable condition. Mathematically the phenomenon is explained as follows:

PV=nRT
Pressure x Volume = Number of Mols x Universal Gas Constant x Temperature

At the time of filling:

Pressure at Filling x Volume at Filling = Air Constant x Temperature at Filling

When the container is moved to be sold at a new site:

Final Pressure x Final Volume = Air Constant x Fill Temperature

As an example, we show a case of a container filled in Bogotá and sold in Barranquilla.

$$\frac{\text{Pressure at Filling}}{\text{Final Pressure}} = \frac{\text{Atmospheric Pressure in Bogotá}}{\text{Atmospheric Pressure in Barranquilla}} = 0.763 \text{ kg/cm2}$$

$$\frac{\text{Pressure at Filling x Volume at Filling}}{\text{Final Pressure x Final Volume}} = \frac{\text{R(air) x T(Filling)}}{\text{R(air) x T (Final)}}$$

$$0.763 \frac{\text{Volume at Filling}}{\text{Final Volume}} = \frac{\text{Temp. at Filling}}{\text{Final Temp.}}$$

If the item is to be handled under refrigeration, then the Temperature at Filling is the same as the final temperature, so

0.763 Volume at Filling = Final Volume

This reduction of air volume is what generates a vacuum, which forces a deformation of the container, especially of its side walls.

In order to avoid collapse of the side walls of the container, three solutions are presented as follows:

1. To increase the thickness of the container's side walls, so they resist the pressure provided by the vacuum as it is created, without suffering any deformation. This solution will cause substantial increases on the container's production costs.
2. To fill the container completely to the top. This solution will avoid the walls from collapsing, but makes the consumer suffer the consequences, since part of the contents will spill when opening the container.
3. To make the deformation occur in a non-visible place of the container.
   This last solution is undoubtedly the best, and thus becomes the objective of the present invention. That is how the "moving-bottom" concept was created. It basically consists of designing the bottom 15 of the container in an outwardly convex shape, with structural design and thicknesses to become the weakest part of the container, although not too weak to break. To achieve this, conclusions were arrived to such as those shown on figures 3 to 16. These structural forms on the lid are conceived to have a spring effect and keeping enough strength to support the stresses and be able to achieve the change of its original form from convex to concave. This change provides the vacuum that is created when the container is moved from a low pressure location to a high pressure location, and this way the container's appearance remains intact before consumers.

   Figures 3 and 4 show a first example where bottom lid 15 shows a design made of pleats or folds distributed on every quadrant of the lid, in order to provide good flexibility and structural strength at the same time.

   Figures 5 and 6 present another style of pleats or folds that cross perpendicularly.

   Figures 7 and 8 show a third example where the pleats are distributed evenly and symmetrically throughout the bottom lid's complete surface providing good flexibility.

Figures 9 and 10 are a fourth design alternative for the invention, similar to Figures 5 and 6.

Figures 11 and 12 show a fourth example of a pleated structure formed by triangular folds that provide good flexibility

Figures 13 and 14 show a bottom lid structure formed by circular sections.

Figures 15 and 16 show a bottom lid design formed by concentric circular folds.

Having described the invention in detail, the samples shown must be taken into consideration only for illustrative means and do not present any limits to the invention. Experts in the field may understand that there exist different styles and variations of the present invention without steering away from its reach.

REPLEVY

1. This is a thermally formed plastic glass-shaped container with a hermetic seal consisting of an aluminum foil or sheet attached to its opening; to be used as a container for milk, jellies, juices, and other perishable products. It is characterized by having a bottom lid initially convex towards the outside, with a series of symmetrically designed pleats distributed uniformly throughout its surface.

2. The container mentioned above is characterized by the design of the pleats in the above-mentioned bottom lid and its thickness, chosen to give it flexibility and structural strength for the lid to remain in its initial convex position when filled and sealed at a given temperature and pressure. When the container is moved to a location with higher pressure, the folds change the bottom lid into a different convex position compensating for the difference in the outside and inside pressures that act on the container, thus avoiding the deformation of the container's walls and keeping its appearance intact.

Jaime Miniño